REMARKS

In this amendment, claim 44 has been amended to properly depend from claim 42. Claims 1-10, 12-14, 17, 20, 22, 24-29, 39, 41, 42, 44, 45, and 50-52 are pending. Reconsideration and withdrawal of the rejections are requested in view of the following remarks.

The pending claims are all rejected as obvious over the Yoshitani et al. reference ("Yoshitani") in view of the Lampert et al. reference ("Lampert"). Yoshitani is directed to an apparatus for physically cleaning a substrate with a layer of ultrasonic rinsing liquid in conjunction with a jet of high-pressure rinsing liquid. The layer of ultrasonic rinsing liquid is formed on the surface of the substrate, while the jet of high-pressure rinsing liquid is directed through the layer of ultrasonic rinsing liquid to remove foreign matter from the surface of the substrate (c. 10, ll. 28-34; Fig 3).

Yoshitani does not teach or contemplate using a chemical cleaning process in conjunction with its physical rinsing process. Indeed, the method taught in Yoshitani is purely a "combined rinsing" method intended to be performed separately from any other substrate processing steps (c. 7, ll. 37-40). Nothing in Yoshitani suggests that a chemical cleaning process could be implemented, or would even be desirable, while the layer of ultrasonic rinsing liquid is present on the substrate. Indeed, it is well known that since ultrasonics relies on cavitation for cleaning, the addition of dissolved gases to the liquid can greatly affect cleaning performance.

Lampert discloses a process in which water is provided to a wafer surface as an aerosol or mist. A gas phase process chemical, such as HF gas, interacts with the water mist at the wafer surface (c. 2, ll. 1-8). Lampert necessarily uses only gas phase process chemicals and a water aerosol, to allow interaction between them. A liquid

layer is not disclosed in Lampert. Rather, Lampert consistently and repeatedly describes only a mist (c. 2, ll. 4, 41, 49; c. 4, ll. 29 and 60; c. 5, l. 60; c. 6, l. 11). Lampert also describes use of water in the form of "a finely divided liquid state" (c. 2, l. 4 and c. 3, l. 65), and as an "aerosol-like water mist" (c. 2, l. 49 and c. 5, l. 60).

Use of the mist, and not a liquid layer, is essential in Lampert to achieve the stated objective of having the water, the process chemical gas, and the wafer surface interact with each other (c. 3, ll. 59-67). Having a liquid layer on the workpiece, as disclosed in Yoshitani, would preclude this three-way interaction as disclosed in Lampert. Indeed, Lampert states that:

> "Advantageously, aqueous phases produced are removed as quickly as possible from the system after they have acted on the wafer surface in order not to upset the balance established between the solid, liquid and gas phases, and to aid in the removal of contaminants which have been collected in the process" (c. 4, ll. 18-23).

Since Lampert requires a balance between solid, liquid and gas phases, it clearly is not a liquid layer type of process. In a liquid layer process, as claimed, no balance of phases is needed or used. Rather, the solid surface of the workpiece is covered by liquid, leaving the gas no access to the solid surface other than via diffusion of the gas through the heated liquid layer.

Lampert also states that:

> "The droplet size, jet direction and jet force are matched to each other so that, at least in the region in which the wafers are provided, a uniform aerosol-like water mist is built up" (c. 2, ll. 40-51).

This refers to the accumulation of the mist over or around the wafer in the chamber (like a cloud), and not formation of a liquid layer. Factors such as droplet size, which would hardly matter in a liquid layer process, as claimed, are matched in Lampert, as is necessary to make the desired mist. In addition, Lampert refers to liquids formed during processing essentially as waste products that are preferably promptly removed (c. 3, ll. 68-69 and c. 4, ll. 18-27).

Thus, Lampert teaches away from forming a liquid layer on a wafer surface. Indeed, one skilled in the art would understand Lampert as teaching a particular chemical processing method, in which a mist of water interacts with a chemically active gas directly at a wafer surface, which is incompatible with Yoshitani's physical "combined rinsing" method, in which a liquid layer through which a high-pressure liquid is jetted is formed on a substrate surface. It is therefore improper to attempt to combine the teachings of Yoshitani with those of Lampert, since their disclosed processes could not logically co-exist (i.e., once a liquid layer is formed on a wafer, a mist intended to interact with a gas at the wafer surface could not be delivered to the wafer surface). Additionally, neither reference makes any mention of how a gas could get to a workpiece surface when a liquid layer is present on the workpiece surface. Thus, claims 1, 25, and 42, all of which recite forming a heated liquid layer on a workpiece and providing ozone around the workpiece (or entraining ozone in a column of heated liquid directed at the workpiece), are all believed to be allowable.

Additionally, with respect to claim 25, neither Yoshitani nor Lampert teaches diffusing ozone through a heated liquid layer to chemically react with a contaminant on a workpiece surface. As explained, Yoshitani is directed to a physical "combined rinsing" process in which no chemical processing is performed. Lampert is directed to a

process in which a liquid mist interacts with a chemical gas directly at a wafer surface. No liquid layer through which ozone may diffuse is formed in Lampert. Indeed, such a liquid layer could not be used in the process taught by Lampert, which requires a mist at the wafer surface. Thus, a claimed feature is entirely absent from the cited references, and claim 25 is therefore believed to be allowable for this reason, as well.

With further respect to claim 42, neither of the cited references discloses entraining ozone gas into a column of heated liquid, and directing the column of heated liquid through a liquid layer on a workpiece surface, such that the entrained ozone gas chemically reacts with a contaminant on the workpiece surface. As explained, no chemical processing is taught in Yoshitani. Lampert does not disclose entraining gas into a column of heated liquid. Entraining involves a moving liquid picking up and carrying gas molecules. In Lampert, the process gas and the water aerosol are separately provided into the chamber (c. 4, ll. 8-10 and c. 5, ll. 46-64). Thus, there can be no entrainment, as claimed. Accordingly, this claimed feature is entirely absent from the cited references, and claim 42 is therefore believed to be allowable for this reason, as well.

In view of the foregoing, it is submitted that the claims are in condition for allowance. A Notice of Allowance is requested.

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Respectfully submitted,

PERKINS COIE LLP

Customer No. 45540
Perkins Coie LLP
Patent - LA
P.O. Box 1208
Seattle, WA 98111-1208
Phone: (310) 788-3267
Fax: (206) 332-7198

By: /Kenneth H. Ohriner/
Kenneth H. Ohriner
Reg. No. 31,646